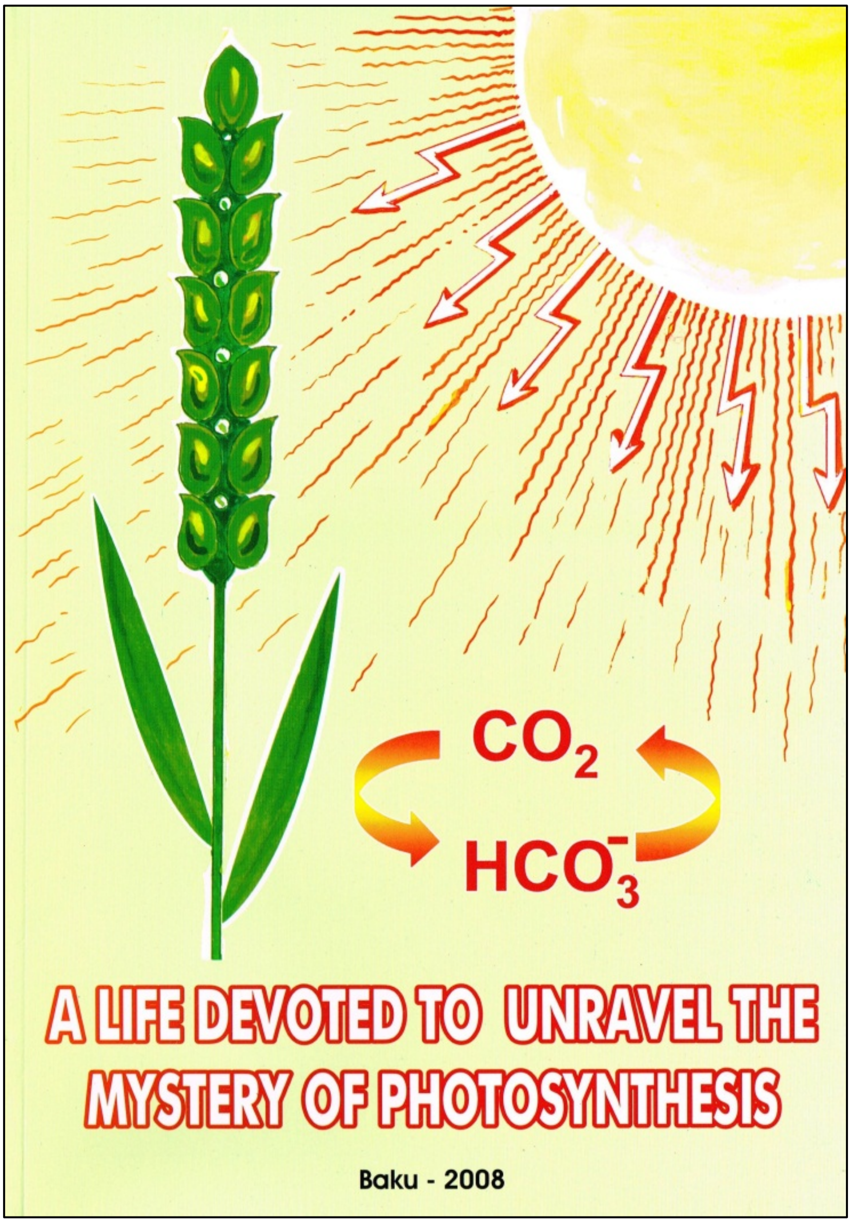
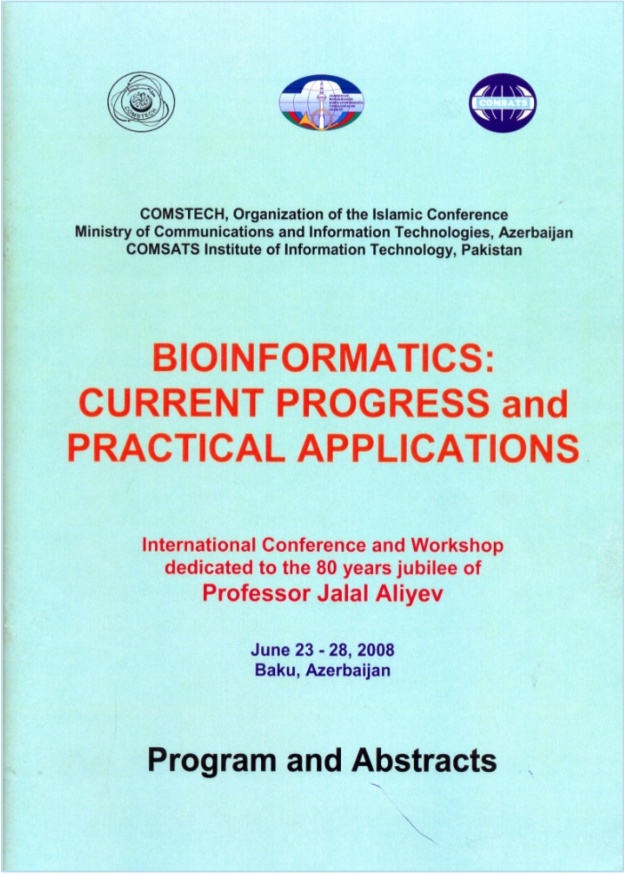


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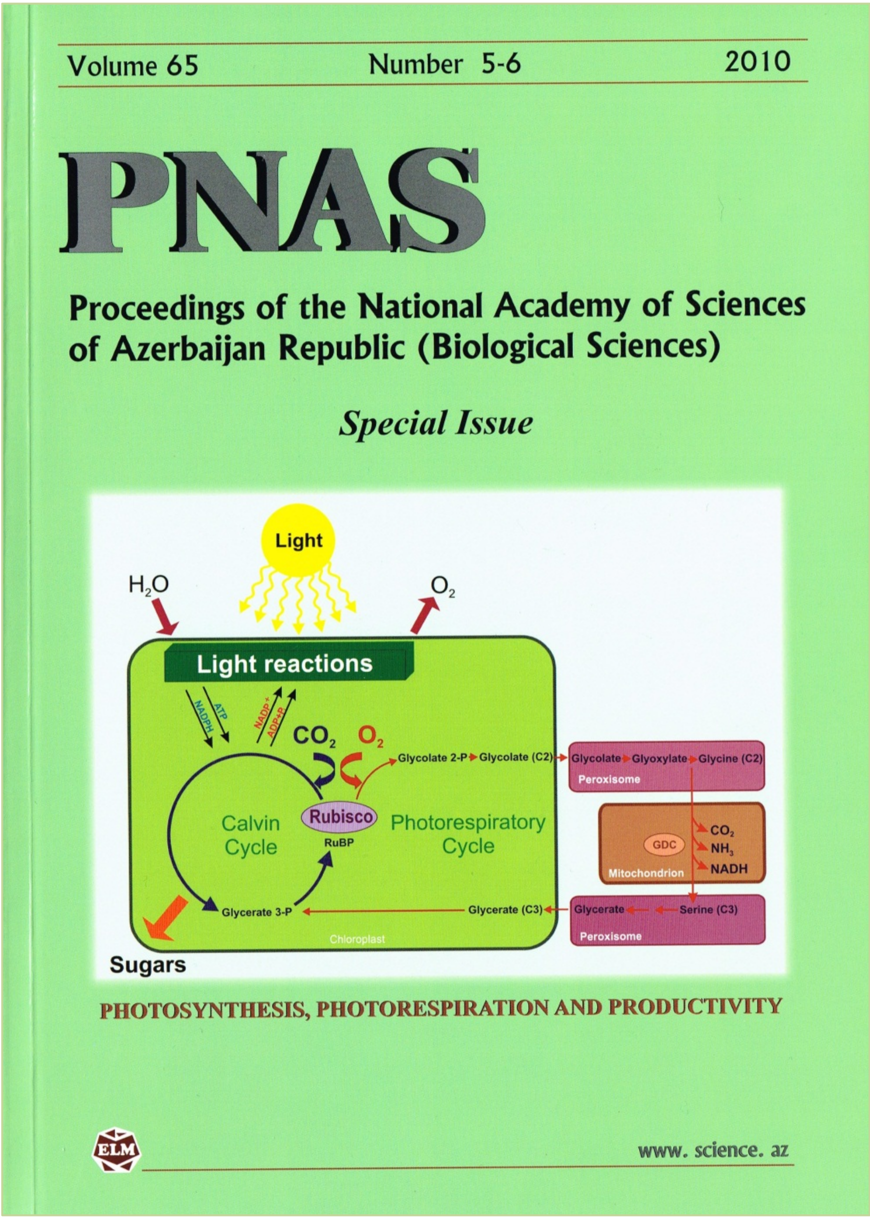
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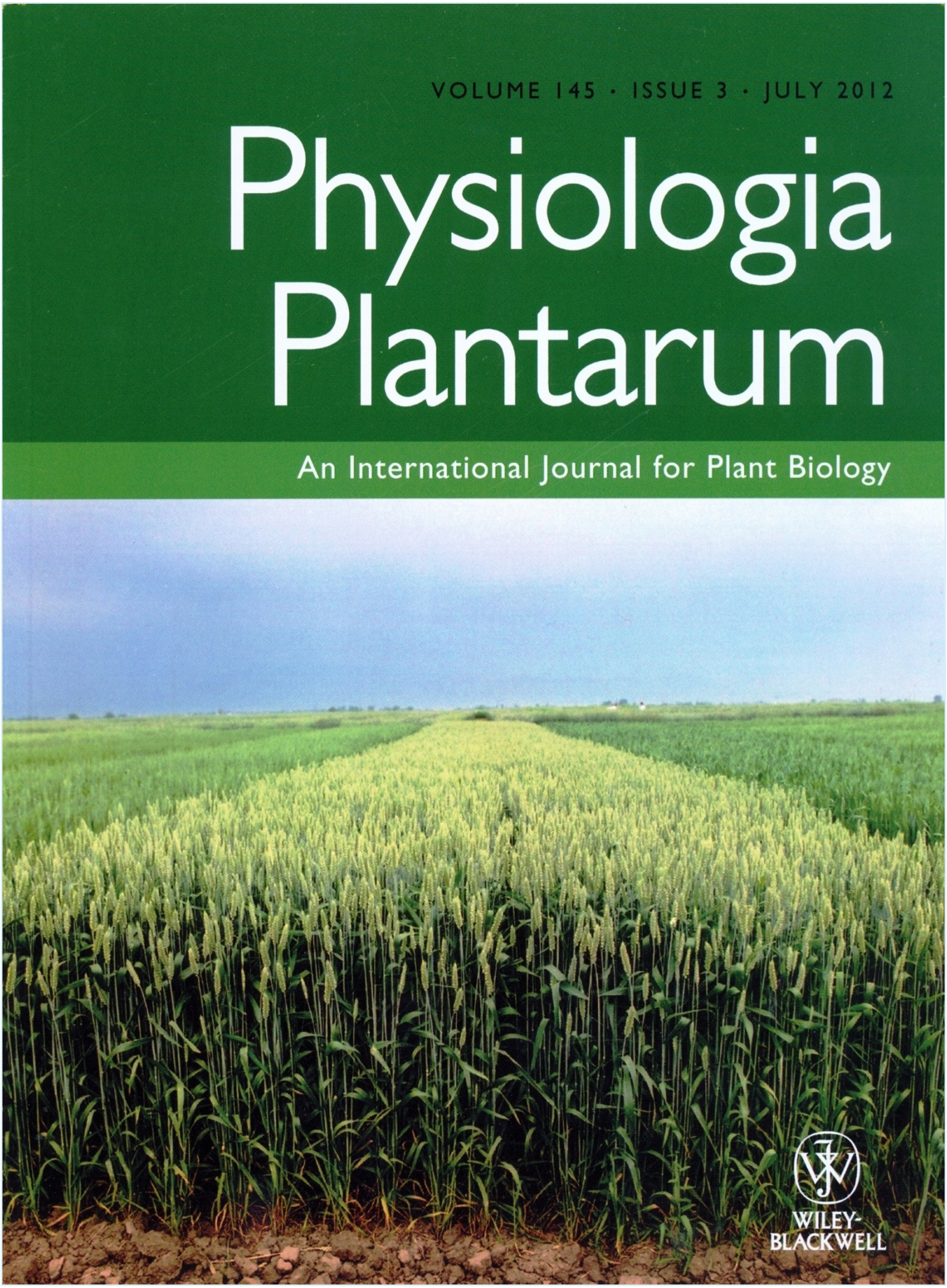


MESSAGE FROM EDITORS

This special issue is dedicated to Professor Jalal A. Aliyev, one of the founders of Bioinformatics in Azerbaijan, on the occasion of the 80^{th} anniversary of this birth year. The topical diversity of papers included in the issue is representative of the diversity that has been undertaken in his illustrious career. We wish Professor Aliyev successful future activities.



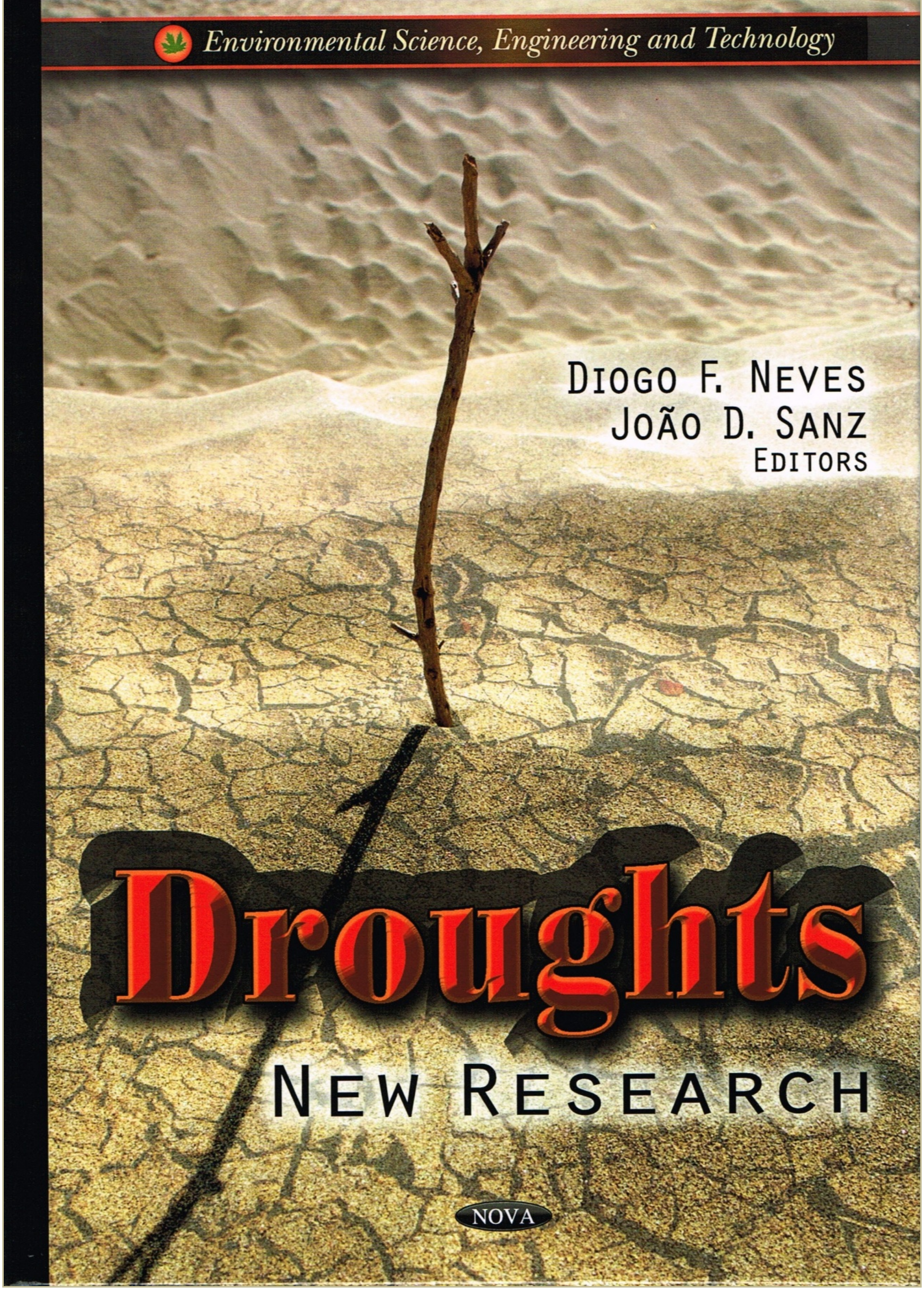
The selected papers of researchers from the Department of Fundamental Problems of Biology Productivity, Institute of Botany of Azerbaijan National Academy of Sciences, and the Department of Plant Physiology and Biotechnology, Research Institute of Crop Husbandry of Ministry of Agriculture of Azerbaijan Republic, who works in Azerbaijan as well as abroad, are published in this special issue


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Editors
Droughts
New Research
NOVA

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Chapter 2

Physiological and Molecular Bases of Drought Tolerance in Wheat (*Triticum* L.) Genotypes

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Abstract

Several thousand wheat (*Triticum* L.) genotypes were grown in field conditions under normal water supply and a severe water deficit. *Triticum durum* L. genotypes distinguish by higher tolerances to water shortage than those of *Triticum aestivum* L. Under severe soil drought conditions during a period of the early spring tillering stage until the end of grain filling, grain yield and protein losses in numerous genotypes constitute within 25-65%. Ear photosynthesis plays a crucial role in crop accumulation and protein synthesis in grain. In tolerant to water stress genotypes, more than 60% of grain yield and protein synthesis is due to ear photosynthesis. Under dry conditions, the afternoon depression of leaf photosynthesis increased and the rate of dark respiration decreased. The rate of photosynthesis of 7- and 8-layered leaves in all genotypes in the evening, and especially in the morning hours, is higher. Photosynthetic rates of 7- and 8-layered leaves decreased greatly at the end of the milk ripeness and beginning of wax ripeness. Under the effect of drought and leaf aging, leaf area and accumulation of dry biomass shorten by more than half. After two weeks of drought, the intervarietal differences in photochemical activity, expressed in the higher reduction in extensive varieties in comparison with the intensive ones, are observed. Activities of Calvin cycle enzymes (phosphoglycerate kinase, NADP-glyceraldehyde dehydrogenase) decrease with strengthening of drought, especially in sensitive genotypes. Such a decline occurs more rapidly in the ear elements at the early stages of development of generative organs. Activity of enzymes of C_4 cycle (PEP-carboxylase, NAD- and NADP-malate dehydrogenase, aspartate aminotransferase) in C_3 plants under soil drought in leaves and ear elements increases significantly and the pyruvate orthophosphate dikinase is activated. The correlation between the genetically determined tolerance of wheat

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